



MathSEE Newsletter 2|2023

Dear Scientists, Dear Students,

Another year nears its end and MathSEE was again buzzing with activity. With our second newsletter we are just as refreshed to present you this edition as when we started with the newsletter in May of this year. Hope you enjoy reading this and will remain a part of MathSEE as you have supported us in the last months and years. While sending you positivity and vibrancy, we wish you a successful fourth quarter and cheerful holiday season.

MathSEE Leadership

The members assembly elected Melanie Schienle as new scientific spokesperson, Mathias Trabs as new deputy scientific spokesperson and a [new mathsee steering committee](#) on October 19th, 2023. The new leadership thanked Prof. Martin Frank for his contributions in shaping MathSEE at the members assembly and presented an outlook towards gaining momentum in the new constellation. The steering committee in its first meeting on October 19th, 2023, reinforced the support and usefulness of exchange between mathematicians and SEE scientists within KIT through thematic workshops as well as regular colloquia with external guests.

MathSEE Symposium 2023

With over 165 contributions (about 50% external to KIT) and 8 invited plenary talks along 4 areas of mathematical methods, the first in-person symposium on “Applications of Mathematical Methods” concluded successfully on the 29th September. KIT Center MathSEE was invited by Springer publication to record the proceedings of the symposium in the form of a book. The organizing committee welcomes the contributions of all participants to the symposium proceedings band and relies on your support in also making this chapter a success. Details on the publication can be found on the [symposium homepage](#). Deadline for submission is the 15th January 2024. Templates can be downloaded [here](#).

MathSEE Method Area Videos

A new project of Method Area Videos was started recently. The short video clips of 3-4 minutes demonstrate one exemplary research topic in each of the four MathSEE method areas. These initial clips are expected to conclude by the first quarter of 2024 and will be available on the MathSEE website.

The project is expected to be extended to another major pillar at MathSEE. Our early career researchers will have the opportunity to present their current projects, achievements and ideas in short videos after the conclusion of method area videos.

MathSEE Seminars

The MathSEE seminar talks are open to all MathSEE members and very well attended. Recent guests at the MathSEE Seminar Series on June 20, 2023 and July 25, 2023 were members of the MathSEE evaluation group. This form of informal exchange would be continued with close but critical friends through regular invitations to seminar talks. The decision on the exchange formats at MathSEE for 2024 will be decided by the new Steering Committee in the upcoming meetings.

MathSEE for Kids: Cooperation with the mathematics young persons lab and CAMMP

At the KIT Open Day on June 17, 2023 as well as at the Experimente Park, the CAMMP student program (**C**omputational **A**nd **M**athematical **M**odeling **P**rogram) and the Young Persons Lab defied the high temperatures with their several offers for the audience. The Wheel of Fortune awoke the interest of the visitors by posing a question. These questions dealt with the topics of the CAMMP workshops for students. The questions were about exciting everyday problems that can be solved with the help of mathematical modeling. The visitors got a teaser of the different modeling workshops and an insight into the relevance of mathematics for our everyday life!

During the day, the wheel of fortune hardly stood still and was able to attract the little visitors to the tent, for whom the organizing team had a simplified version of the questions ready. Because as the saying goes? Early practice makes perfect!

Workshop: Deep Learning - Recent Advances in Kernel Methods for Neural Networks

The joint workshop of the Institute of economics, KIT center MathSEE and Graduate school KCDS took place on the 5th and 6th October at Triangel Open Space. The workshop highlighted the importance of both neural networks and kernels to successfully address applications. The workshop was partially funded by KIT Center MathSEE and partially by the HIDA course funding.

KIT Graduate School of Computational and Data Science

From September 18-20, the first KCDS Summer School took place at KIT, organized by KCDS PhD students on their own initiative. In the practical parts of the Summer School, the participants were able to try out the theoretical contents directly and get to know programming languages and software environments such as Julia, the Sparse Labs Matlab KIT and UM-Bridge.

The Summer School was financially supported by the Helmholtz Information and Data Science Academy (HIDA) and was also open to participants from KIT, other Helmholtz centers and beyond. In addition to members of KCDS, PhD students from the thematically related Graduate School for Climate and Environment (GRACE) and

Helmholtz Information & Data Science School For Health (HIDSS4Health), among others, also participated, thus expanding the KCDS network. The program was rounded off by a poster session of the participants, a brewery tour and a Summer School Dinner.

Awards & Recognition

- Tilmann Gneiting, Scientific Director of the Heidelberg Institute for Theoretical Studies (HITS) and Professor of Computational Statistics at KIT, received the 2024 Ulf Grenander Prize for Stochastic Theory and Modeling from the American Mathematical Society.
- Alik Ismail-Zadeh was re-elected as Chair of the Commission on Mathematical Geophysics of the International Union of Geodesy and Geophysics (IUGG) for 2023-2027.
- Jan Schaßberger received the Best Paper by Young Author Award at the 24th International Conference on Process Control.
- The 34th IUGG Conference on Mathematical Geophysics, to be held June 2-7, 2024, at the Indian Institute of Technology Bombay in Mumbai, India, will be co-organized by MathSEE member Alik Ismail Zadeh. Website: <https://www.cmg2024.org/>

Outstanding publications

Journal Articles

The following publications on applications of mathematical methods were published recently by MathSEE researchers:

- The conditions at which dynamical escape from a potential well is possible under time-limited excitation, as well as the corresponding safety basin (i.e., the set of initial conditions at which the system does not leave the potential well), have been studied in the following paper. Both analytical estimates of these regions and numerical results have been obtained, showing that the actual boundaries of the safety basin have a very complex fractal structure. *Kravets P., Gendelman O., Fidlin A.; Resonant escape induced by a finite time harmonic excitation; Chaos 2023, <https://doi.org/10.1063/5.0142761>*
- Industrial processes can contribute to the energy transition by providing energy flexibility, which requires a shift away from steady-state plant operation. This is associated with challenges for process automation, as product requirements must be consistently met despite increased flexibility, which requires powerful control-motivated system models. The paper extends a rotary dryer model for the Belite cement process by considering additional thermal capacities. Simulations show a strong influence of this model extension on the transient system behavior. The developed model reflects qualitatively better the behavior observed in the literature. *Schaßberger J., Hagenmeyer V., Gröll L.; From Stationary to Flexible Plant Operation: Extension of a Co-Current Rotary Dryer Model for Energy Demand Flexibility; 24th International Conference on Process Control; <http://dx.doi.org/10.1109/PC58330.2023.10217594>*

- The growth of lava domes and lava flows is one of the main manifestations of non-eruptive hazardous volcanic events. Using the mesh-free smoothed particle hydrodynamics method, a 3D model of lava dynamics was developed. The modified numerical method is verified by solving a model of a cylindrical dam-burst flow, and the modeled results are compared with the analytical solution of the axisymmetric viscous thin-layer flow problem. *Starodubtsev, I.S., Starodubtseva, Y.V., Tsepelev, I.A., and Ismail-Zadeh, A. Three-dimensional numerical modeling of lava dynamics using the smoothed particle hydrodynamics method. J. Volcanol. Seismol., 17, 175–186, 2023. <https://doi.org/10.1134/S0742046323700185>*
- Wolfram D., Abbott S., an der Heiden M., Funk S., Günther F., Hailer D., Heyder S., Hotz T., van de Kasstelee J., Küchenhoff H., Müller-Hansen S., Syligi S., Ullrich A., Weigert M., Schienle M, Bracher J.; Collaborative nowcasting of COVID-19 hospitalization incidences in Germany, PLOS Computational Biology, <https://doi.org/10.1371/journal.pcbi.1011394>

Important Dates and Planned Events

MathSEE PhD Seminar (Annalena Albicker)	4 December 2023
Symposium Proceedings Contributions	15 Januar 2024

Further dates are found on the [MathSEE-Website](#).

Membership and Newsletter

If you would like someone to become a member of KIT center MathSEE; please forward the following link to them: <https://www.mathsee.kit.edu/765.php>.

If you no longer wish to receive news from KIT Center MathSEE, please send an email to mathsee@kit.edu.